

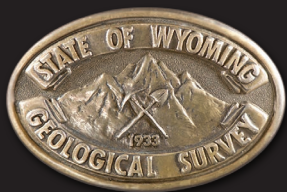
# Wyoming's Oil and Gas Resources

## Summary Report February 2014

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## Wyoming State Geological Survey

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[www.wsgs.uwyo.edu](http://www.wsgs.uwyo.edu)

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### Introduction

Production of Wyoming's oil and natural gas resources are on two different tracks: oil continues to grow, while natural gas remains in a steady decline.

Wyoming oil production increased 5 percent from 2011 to 2012, primarily because of the application of improved technology and the emergence of new unconventional plays. Directional and horizontal drilling, as well as hydraulic fracturing in unconventional plays, have resulted in a nationwide surge in production, leading the U.S. Energy Information Administration (EIA) in December 2013 to predict that domestic oil production will continue to rise for the next five years.

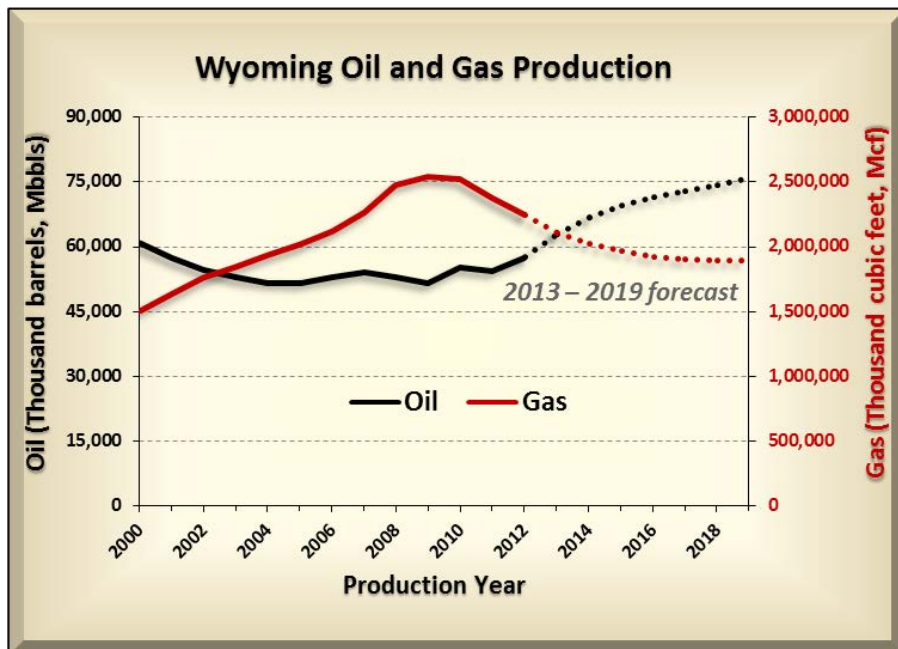
In Wyoming, from a revenue perspective, the increased crude oil production is offsetting declining revenue from coalbed natural gas production. Wyoming crude oil averaged \$86 per barrel for the first 11 months of 2013, and the state is expected to have produced about 63 million barrels of oil in 2013, placing it eighth in EIA's U.S. crude oil production rankings.

Natural gas production in Wyoming, however, has steadily decreased since 2009. This decrease is a result of a decline in prices, the depletion of existing fields, and because several large proposed projects on federal lands are working their way through the federal regulatory review process. Two-thirds of Wyoming's natural gas is produced on federal lands through industry lease agreements, primarily from fields in southwest and south-central Wyoming.

Production can be delayed by the amount of time it takes for regulatory and environmental reviews. In 2012, the EIA reduced Wyoming's ranking for natural gas production from third to fifth, and currently accounts for more than 8 percent (2.25 trillion cubic feet) of total U.S. production.

Other factors such as national demand, competition, and pricing also play a role in the fluctuation of Wyoming's oil and gas production numbers. Wyoming uses a small portion of its crude oil and natural gas in-state, but the majority is transferred through major interstate pipelines to the Midwest and West Coast. What remains clear is the extraction, processing, and transportation of these energy sources to their intended markets is complex and constantly evolving.

- In 2012, Sublette County produced 47.7% of the state's natural gas (1.1 trillion cubic feet). Johnson and Sweetwater counties were the 2nd and 3rd next-largest producing counties in 2012, producing 11.8% (265.6 billion cubic feet) and 11.6% (261.5 billion cubic feet) of the state's total gas production, respectively.
- In 2012, 37,301 wells in Wyoming produced oil and/or natural gas.



Based on analyses of past production and new projects, the Wyoming State Geological Survey estimates that Wyoming oil production will increase in the next few years while natural gas production will likely decline.

## The Oil Story

The Powder River Basin is at the forefront of Wyoming oil production and is leading the way in what many are calling a second oil boom. Although not nearly as large as the original boom that peaked at 160 million barrels in 1970, there has been a steady increase in oil production since 2009. Current production is up nearly 12 percent from 2009, with over 57.5 million barrels of oil produced in 2012.

Increased oil production is occurring primarily in Campbell and Converse counties. Both counties have seen a surge in applications for permits to drill (APDs). In 2013, APDs were up almost 27 percent in Campbell County (916 APDs) compared to 2012, and over 40 percent in Converse County (794 APDs).

Oil in the Powder River Basin is produced primarily from the Cretaceous age Frontier Formation, the Shannon and Sussex sandstone members of the Cody Shale, and the Mesaverde

- In 2012, Campbell County was the state's leading producer of crude oil (9.8 million barrels), followed by Park (7.1 million barrels) and Sublette (6.8 million barrels) counties.
- According to Research and Planning of the Wyoming Department of Workforce Services, Wyoming's oil and gas industry employed more than 25,400 people in 2012, an almost 59% increase from 2002. The average 2012 salary of these workers was \$56,277 and the total wages paid to all oil and gas employees in 2012 was approximately \$1.4 billion.

Formation. Oil shows were previously noted when drilling through these formations to the deeper conventional Tensleep Sandstone oil reservoirs. At the time, however, the shows were not large enough for economic development. Recent technological advancements that include lengthy horizontal wells (up to 10,000 feet of horizontal displacement), multi-lateral completions, and multi-stage hydraulic fracturing have allowed for economic production of oil from these formations.

Geologists at the Wyoming State Geological Survey (WSGS) are actively working to understand the distribution and reservoir properties of these unconventional oil plays, which will help guide future discoveries and provide data necessary for more efficient oil recovery.

## New Development

Currently, there are 17 oil and gas projects throughout Wyoming in the permitting or early development phase, with many in the Greater Green River and Wind River basins. If approved, these projects are expected to begin development between 2014 and 2018, with the drilling of more than 23,000 wells. This would potentially offset the statewide decline in gas production from the large natural gas fields of Jonah and Pinedale, where infill drilling is currently taking place.

The rapid advancement in drilling technology has also influenced development plans for many of these large projects. Directional and horizontal drilling allows for the siting of multiple wells on a single well pad. Such technological advances minimize the adverse impacts on the land from energy development.

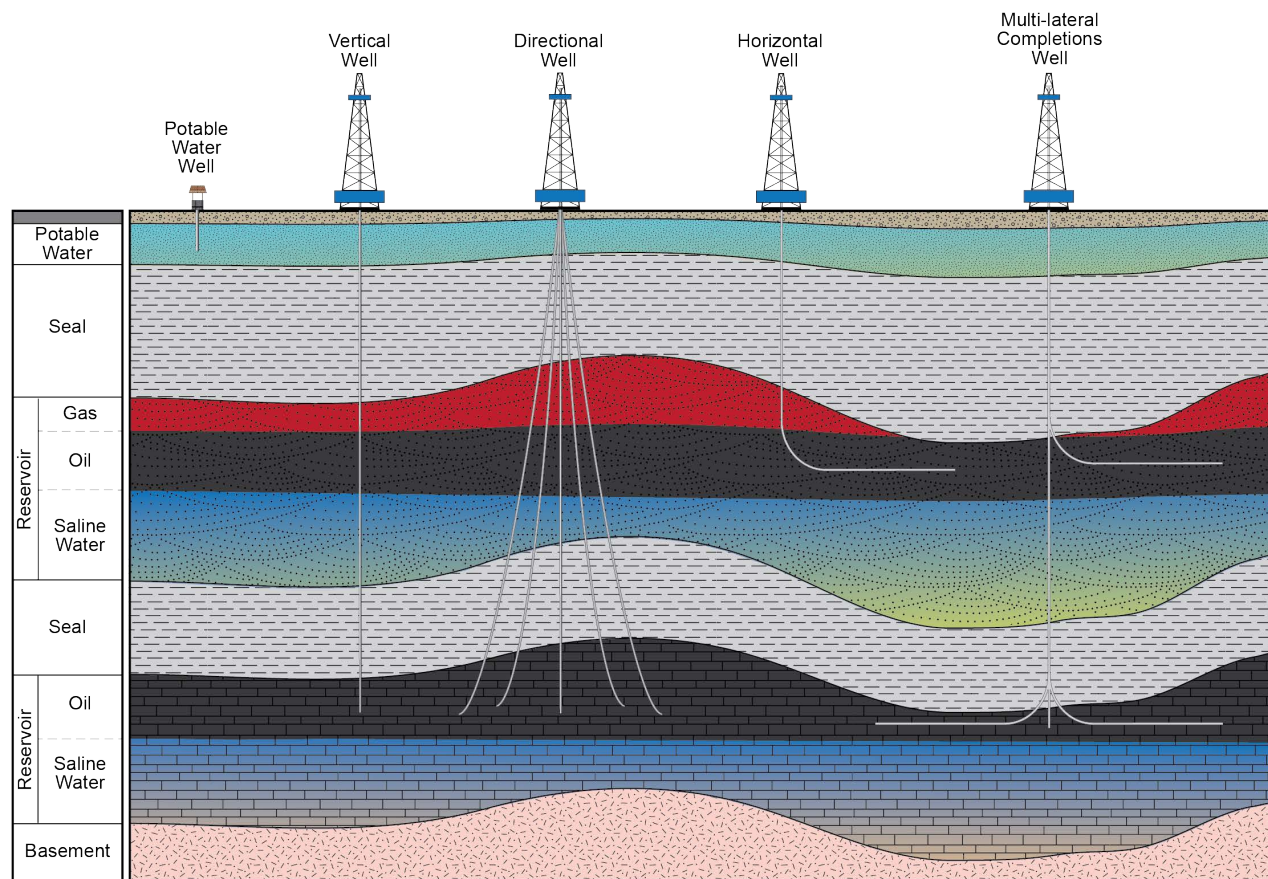
Additional information on oil and gas development areas in the state is available on the WSGS website at [www.wsgs.uwyo.edu/development-areas/](http://www.wsgs.uwyo.edu/development-areas/).

## Coalbed Natural Gas

Coalbed natural gas production in the Powder River Basin has been declining since 2009 and currently accounts for 18 percent of Wyoming's natural gas production. The decline is due to the drop in natural gas prices worldwide, the depletion of reservoirs, and competition from unconventional gas resources. Much of the remaining reserves in the Powder River Basin are currently not economically viable for development. Natural gas prices would need to increase significantly and consistently for any further coalbed natural gas development to occur. The Wyoming Oil and Gas Conservation Commission is in the process of reviewing options for the "orphaned" coalbed natural gas wells that were abandoned by operators but still remain in the Powder River Basin region.

## Enhanced Oil Recovery

Enhanced oil recovery (EOR) with carbon dioxide (CO<sub>2</sub>) is occurring in a handful of fields throughout the state. Grieve field,



Conventional wells are drilled vertically from the surface straight down to the pay zone. This is the traditional and most common type of drilling. Horizontal drilling begins in a vertical position then turns horizontal to access a larger pay zone. Directional drilling often involves multiple wells from a single well pad. *Graphic by James R. Rodgers.*

west of Casper, is the latest to use CO<sub>2</sub> to displace oil in this mature field. Salt Creek, the most-productive and one of Wyoming's oldest oil fields (discovered in the late 1880s), is continuing a CO<sub>2</sub>-EOR field-wide expansion project with plans to convert 831 existing wells and drill 586 new wells (2012 BLM Decision Record). Projects such as these will help Wyoming continue to produce from mature oil fields, estimated to account for more than 90 percent of Wyoming's fields, according to the University of Wyoming's Enhanced Oil Recovery Institute.

## Future Scenarios

Although predicting the future of Wyoming's energy resources is far from an exact science, there are several recent trends that are anticipated to continue with the state's oil and gas resources. Statewide oil production is expected to increase over the next few years, primarily from unconventional reservoirs. The WSGS estimates 2014 oil production to be greater than 66 million barrels and natural gas production of approximately 2 trillion cubic feet. Gas production will likely continue to decline, but this decline may be slowed by the large natural gas projects that are currently in the permitting phases in the Greater Green River and Wind River basins, as well as by associated gas production from the emerging unconventional plays.

Advances in drilling and completion technologies, combined with improved hydrocarbon recovery, and a regulatory frame-

work that promotes resource conservation, have better positioned Wyoming as a leader in hydrocarbon production, electricity generation, exportation, and progressive industry regulations for years to come.

*Data from the Wyoming Oil and Gas Conservation Commission at [www.wogcc.state.wy.us](http://www.wogcc.state.wy.us).*

## WSGS Oil and Gas Geologists

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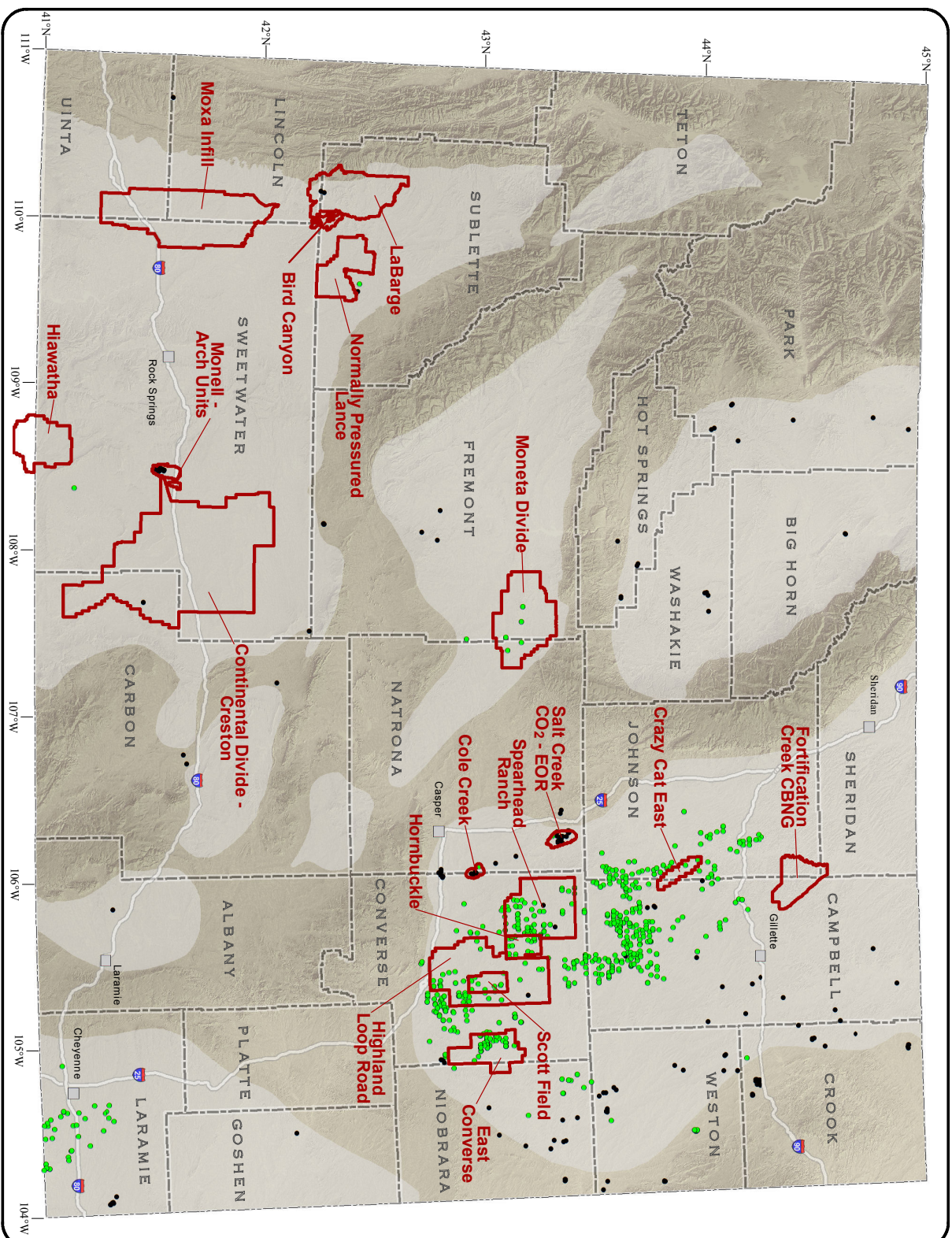
For information, scan this QR code to access the WSGS oil and gas website.

[www.wsgs.uwyo.edu](http://www.wsgs.uwyo.edu)



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#### EXPLANATION

Energy basins

- Oil wells permitted or spudded in 2013
- Horizontal
  - Vertical or directional

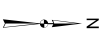
Oil and gas development areas

(more information available at <http://www.wsgs.wyo.edu/development/areas/>)

City or town

Interstate highway

County boundary



## Oil and Gas Development in Wyoming